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(71) Applicant
Magnet Holdings Limited

(Incorporated in the United Kingdom)

**Royd Ings Avenue, Kelghley, West Yorkshire,
BD21 4BY, United Kingdom**

(72) Inventor
David Stephen Baker

(74) Agent and/or Address for Service
Audrey Knowles & Co
**624 Perakore Road, Selly Park, Birmingham, B29 7HG,
United Kingdom**

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(56) Documents cited
**GB 1430423 A GB 1275511 A GB 1237744 A
GB 1127915 A EP 0248127 A US 3526420 A**

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**UK CL (Edition K) F2M
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Online databases: WPI**

(54) Joint

(57) A joint between the adjoining side edges of two similar panels, 1, 1' in which one panel 1 has a channel-section recess 9 open towards the front face 3 and the other panel 1' has a rib 10 facing towards the rear face 4 for reception in the recess 9 to restrict separation of the panels 1, 1' to provide a predetermined expansion gap between the adjacent side edges. The panels may be tongue (5) and groove (6) boards in the construction of a door.

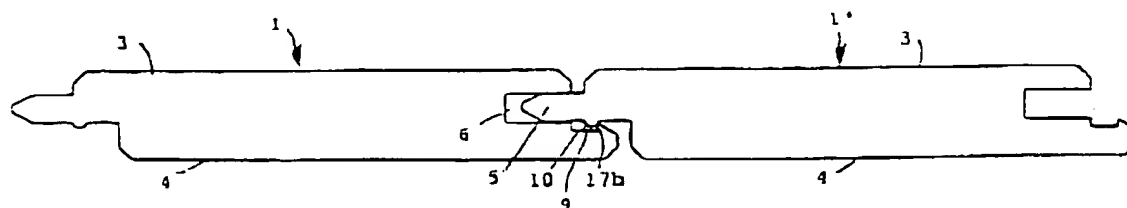


FIGURE 5.

JOINT

This invention relates to an improved joint between the adjoining side edges of two panels and to a panel for assembly with an adjoining panel to produce such joint.

It is well known to provide a tongue and groove joint between the adjoining side edges of two panels such as wooden panels used for flooring, cladding and the like.

The known panels have a tongue on one side edge and a complementary groove on the opposed side edge such that similar panels can be assembled by inserting the tongue of one panel into the groove of the adjoining panel.

Usually, the tongue is inserted fully into the groove so that the side edges of the panels abut one another to support the panels against deflection.

A problem arises, however, where wooden panels are exposed to moisture, for example when used to construct external doors or during building work, as the panels swell causing the butted side edges of the panels to deform creating a ridge in the front surface.

It has already been proposed to allow for swelling of the panels by making the tongue slightly longer than the groove is deep so that, when the tongue is inserted fully into the groove, the side edges of the panels are slightly spaced apart.

This solution is not entirely satisfactory, however, in that swelling of the panels still creates deforming forces between the panels through the engagement of the tip of the tongue with the base of the groove.

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It is an object of the present invention to provide an improved joint and a panel for use in forming the joint which mitigates the problems of the known joints and panels.

According to one aspect of the invention we provide a joint between adjoining side edges of two panels wherein the side edges have co-operating formations adapted to restrict separation of the panels to provide a pre-determined spacing between the side edges in the assembled joint.

Preferably, the panels have front and rear faces and the co-operating formations are provided between the front and rear faces.

Conveniently, the co-operating formations comprise a longitudinal recess on one panel that is open towards one of said faces and a longitudinal rib on the other panel that faces towards the other of said faces for reception in the recess in the assembled joint.

With this arrangement, the rib is engageable with one side edge of the recess to restrict separation of the panels to provide the pre-determined spacing between the side edges of the panels in the assembled joint.

The rib may be engageable with the opposed side edge of the recess when the side edges of the panel abut one another or this engagement may provide a pre-determined minimum spacing between the side edges of the panel in the assembled joint.

Advantageously, one of the rib and recess is provided on a projection on the side edge of one panel and the other of the rib and recess is provided in a rebate on the side edge of the other panel in which the projection is received in the assembled joint.

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Preferably, the joint includes a tongue on the side edge of one panel that is received in a groove on the adjoining side edge of the other panel whereby the panels are interlocked to resist deflection in a direction normal to the front and rear faces.

Advantageously, the tip of the tongue is of reduced cross-section, for example the tip may have opposed chamfer faces. In this way, the panels may be tilted relative to each other with the tongue partially engaged in the groove for locating the rib in the recess when assembling the joint.

According to another aspect of the invention we provide first and second panels for assembly along adjoining side edges to form the joint according to the first aspect of the invention.

Preferably, the first and second panels are similar having the co-operating formations on opposed side edges.

According to yet another aspect of the invention we provide a panel having co-operating formations on the opposed side edges constructed and arranged such that when the panel is joined to a similar panel along adjoining side edges, the co-operating formations restrict separation of the panels to provide a pre-determined spacing between the side edges.

Preferably, the panel has a projection on one side edge and a rebate on the opposed side edge, one of the projection and rebate having a recess open towards one face of the panel and the other of the projection and rebate having a rib facing towards the other face of the panel.

Other features, benefits and advantages of the invention in each of its aspects will be apparent from

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the following description of exemplary embodiments with reference to the accompanying drawings wherein:-

Figure 1 is a perspective view from one side of a panel according to the present invention;

Figure 2 is a perspective view from the other side of the panel shown in Figure 1;

Figure 3 is a transverse section, to an enlarged scale of the panel shown in Figures 1 and 2;

Figure 4 is a transverse cross-section through a joint between two panels according to the present invention showing the panels in a first limit position with the side edges abutting;

Figure 5 is a transverse section similar to Figure 4 showing the panels in a second limit position with adjacent side edges slightly spaced apart;

Figure 6 is a front view of a door constructed from panels of the type shown in Figures 1 to 3;

Figure 7 is a rear view of the door shown in Figure 6; and

Figure 8 is a transverse section through the stiles and panels of the door shown in Figures 6 and 7.

Referring first to Figures 1 to 5 of the accompanying drawings, a wood panel 1 and a joint 2 between two similar panels 1,1' are shown and, in the following description, reference will be made to one or both panels as convenient for understanding of the invention in each of its aspects.

The panel 1 has parallel front and rear faces 3 and 4 respectively and is of uniform cross-section throughout its length.

Between the front and rear faces 3 and 4, the panel 1 has a longitudinal tongue 5 on one side edge and a longitudinal groove 6 on the opposed side edge

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for reception of the tongue 5 of the adjoining panel 1' to form the joint 2.

The panel 1 further has a longitudinal projection 7 on the side edge between the groove 6 and the rear face 4 and a longitudinal rebate 8 on the opposed side edge between the tongue 5 and rear face 4 for reception of the projection 7 of the adjoining panel 1' when the tongue 5 is inserted into the groove 6.

The projection 7 has a longitudinal recess 9 of channel-section open towards the front face 3 of the panel 1 and the rebate 8 has a longitudinal rib 10 of convex profile facing towards the rear face 4 of the panel 1 for reception in the recess 9 of the adjoining panel 1' when the tongue 5 is inserted into the groove 6.

Above and below the tongue 5, offset upper and lower side edge faces 11a, 11b extend normal to the front and rear faces 3 and 4 and meet bevel faces 12a, 12b respectively at the front and rear faces 3 and 4.

Similarly, above and below the groove 6, offset upper and lower side edge faces 13a, 13b extend normal to the front and rear faces 3 and 4 and meet bevel faces 14a, 14b respectively at the front and rear faces 3 and 4.

The tip of the tongue 5 is provided on opposite sides with respective chamfer faces 15a, 15b such that the panel 1' can tilt relative to the panel 1 with the tongue 5 partially inserted into the groove 6 for locating the rib 10 in the recess 9.

Such location of the rib 10 in the recess 9 is effected automatically when the panels 1, 1' are pushed

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together by engagement of the rib 10 with an inclined chamfer face 16 at the tip of the projection 7 which causes the panel 1' to tilt relative to the panel 1 assisted by the chamfer faces 15a,15b at the tip of the tongue 5.

The opposed side edges 17a,17b of the recess 9 are engaged by the rib 10 to limit the relative spacing of the adjoining side edges of the panels 1,1' as desired.

In a first limit position shown in Figure 4, the rib 10 engages the inner side edge 17a of the recess 9 when the tongue 5 is fully inserted into the groove 6 and the side edges of the panels 1,1' abut one another. In this position, the tip of the tongue 5 is slightly spaced from the base of the groove 6.

In a second limit position shown in Figure 5, the rib 10 engages the outer side edge 17b of the recess 9 when the tongue 5 is partially received in the groove 6 and the side edges of the panels 1,1' are spaced apart.

As will now be understood, the engagement of the rib 10 with the outer side edge 17b of the recess 9 restricts separation of the panels 1,1' and provides a positive indication to the user of a desired spacing between the side edges to allow for expansion of the panels 1,1' as may be caused if the panels 1,1' are exposed to moisture. In this way, assembly of adjoining panels 1,1' in a regular uniform manner with pre-determined spacing therebetween is facilitated.

A further benefit of such pre-determined location of the side edges of the panels 1,1' is that the tip of the tongue 5 is spaced from the base of the groove 6 thereby ensuring that expansion of the panels 1,1' does not result in transmission of forces tending to deform

the panels 1,1' through engagement between the tip of the tongue 5 and the base of the groove 6.

Additionally, by restricting separation of the panels 1,1' to control the spacing between the side edges, it is ensured that partial engagement of the tongue 5 in the groove 6 sufficient to resist deflection of the panels 1,1' is obtained.

In the embodiment above-described, the engagement of the rib 10 with the inner side edge 17a of the recess 9 corresponds to engagement of the upper and lower side edges faces of the adjoining panels 1,1' such that the bevel faces form V-shaped notches 18 where the front and rear faces of the panels meet each other.

Referring now to Figures 6 to 8, an external panel door 20 is shown comprising a plurality of vertical panels 21 having adjoining side edges connected by the joint 2 above-described with the panels 21 spaced apart as shown in Figure 8 to allow for expansion of the panels 21 without deforming.

The outer panels 21a,21b joined to stiles 22 are provided with the edge formation for forming the joint 2 on one side edge only, the other side edge being plain for reception in a longitudinal rebate 23 in the stile 21. The intermediate panels 21c are all similar to the panel 1 above-described having the edge formations for forming the joint 2 on both side edges.

The invention is not limited to the embodiments above-described. For example, the invented panel and joint thereby may be used in any application where controlled spacing of the panels is desired to allow for expansion of the panels such as flooring, cladding of walls or ceilings or even the construction of sheds or the like.

The co-operating edge formations forming the joint may be of any suitable shape and configuration which provides a positive indication of a desired spacing between the side edges. For example, in certain applications, it may not be necessary to provide the panels with interlocking tongue and groove formations to resist deflection of the panels and a simple overlap joint may be provided between the adjoining side edges with the rib and recess being provided on opposed overlapping surfaces of the joint.

Each panel may have the cooperating formations on opposed side edges for assembly with similar panels as described. Alternatively, the panels may be of two types each having a respective one of the co-operating formations on both side edges.

The rib and recess may be replaced by any other suitable means for providing a positive indication of the relative positions of the adjoining side edges of the panels.

Although the invention has been described with reference to panels made of wood where the controlled spacing of the panels is of particular benefit, it will be understood that the panels may be made of other materials, for example laminates such as plywood, composites such as chipboard, or plastics such as PVC which can be extruded to any desired cross-section.

It will also be understood that the panels may be of any length, width or thickness having any pattern or decoration applied to or formed in the front and/or rear faces.

To prevent mis-assembly of the panels, the tongue and groove are offset towards the front face of each panel so that the front faces of adjoining panels are co-planar only when the panels are assembled in the correct orientation.

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Claims:

1. A joint between adjoining side edges of two panels wherein the side edges have co-operating formations adapted to restrict separation of the panels to provide a pre-determined spacing between the side edges in the assembled joint.
2. A joint according to Claim 1 wherein the panels have front and rear faces and the co-operating formations are provided between the front and rear faces.
3. A joint according to Claim 1 or Claim 2 wherein the co-operating formations comprise a longitudinal recess on one panel that is open towards one of said faces and a longitudinal rib on the other panel that faces towards the other of said faces for reception in the recess in the assembled joint.
4. A joint according to Claim 3 wherein the rib is engageable with one side edge of the recess to restrict separation of the panels to provide the pre-determined spacing between the side edges of the panels in the assembled joint.
5. A joint according to Claim 4 wherein the rib is engageable with the opposed side edge of the recess when the side edges of the panel abut one another or to provide a pre-determined minimum spacing between the side edges of the panel in the assembled joint.
6. A joint according to any one of Claims 3 to 5 wherein one of the rib and recess is provided on a projection on the side edge of one panel and the other of the rib and recess is provided in a rebate on the side edge of the other panel in

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which the projection is received in the assembled joint.

7. A joint according to any preceding Claim wherein a tongue is provided on the side edge of one panel for reception in a groove on the adjoining side edge of the other panel, and the tip of the tongue is preferably of reduced cross-section, for example the tip may have opposed chamfer faces.

8. A joint according to Claim 7 wherein adjacent side edge faces of the adjoining panels above the tongue and groove formations are laterally offset relative to the adjacent side edge faces below the tongue and groove formations.

9. The combination of first and second panels for assembly along adjoining side edges to form the joint according to any preceding Claim.

10. The combination according to Claim 9 wherein the first and second panels are similar having the co-operating formations on opposed side edges.

11. A panel having co-operating formations on the opposed side edges constructed and arranged such that when the panel is joined to a similar panel along adjoining side edges, the co-operating formations restrict separation of the panels to provide a pre-determined spacing between the side edges.

12. A panel according to Claim 11 wherein the panel has a projection on one side edge and a rebate on the opposed side edge, one of the projection and rebate having a recess open towards one face of the panel and the other of the projection and rebate having a rib facing towards the other face of the panel.

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13. A panel according to Claim 12 having tongue and groove formations on the opposed side edges.
14. A panel according to Claim 13 wherein the tongue is on the rebate side edge and the groove is on the opposed projection side edge.
15. A panel according to Claim 14 wherein the recess is formed in a face of the projection between and substantially parallel to the front and rear faces of the panel.
16. A panel according to Claim 15 wherein said face is substantially coplanar with a sidewall of the groove.
17. A panel according to Claim 16 wherein the inner edge of the recess is aligned with a transverse abutment face on the side edge of the panel.
18. A panel according to any one of Claims 14 to 17 wherein the rib is formed on a face of the rebate between and substantially parallel to the front and rear faces of the panel.
19. A panel according to Claim 18 wherein said face is substantially co-planar with one side of the tongue.
20. A panel according to Claim 19 wherein the outer edge of the rib is aligned with a transverse abutment face on the side edge of the panel.
21. A door constructed from a plurality of panels having adjoining side edges connected by the joint according to any one of Claims 1 to 8.
22. Use of the combination according to Claim 9 or Claim 10 or a panel according to any one of Claims 11 to 20 in the construction of a door.

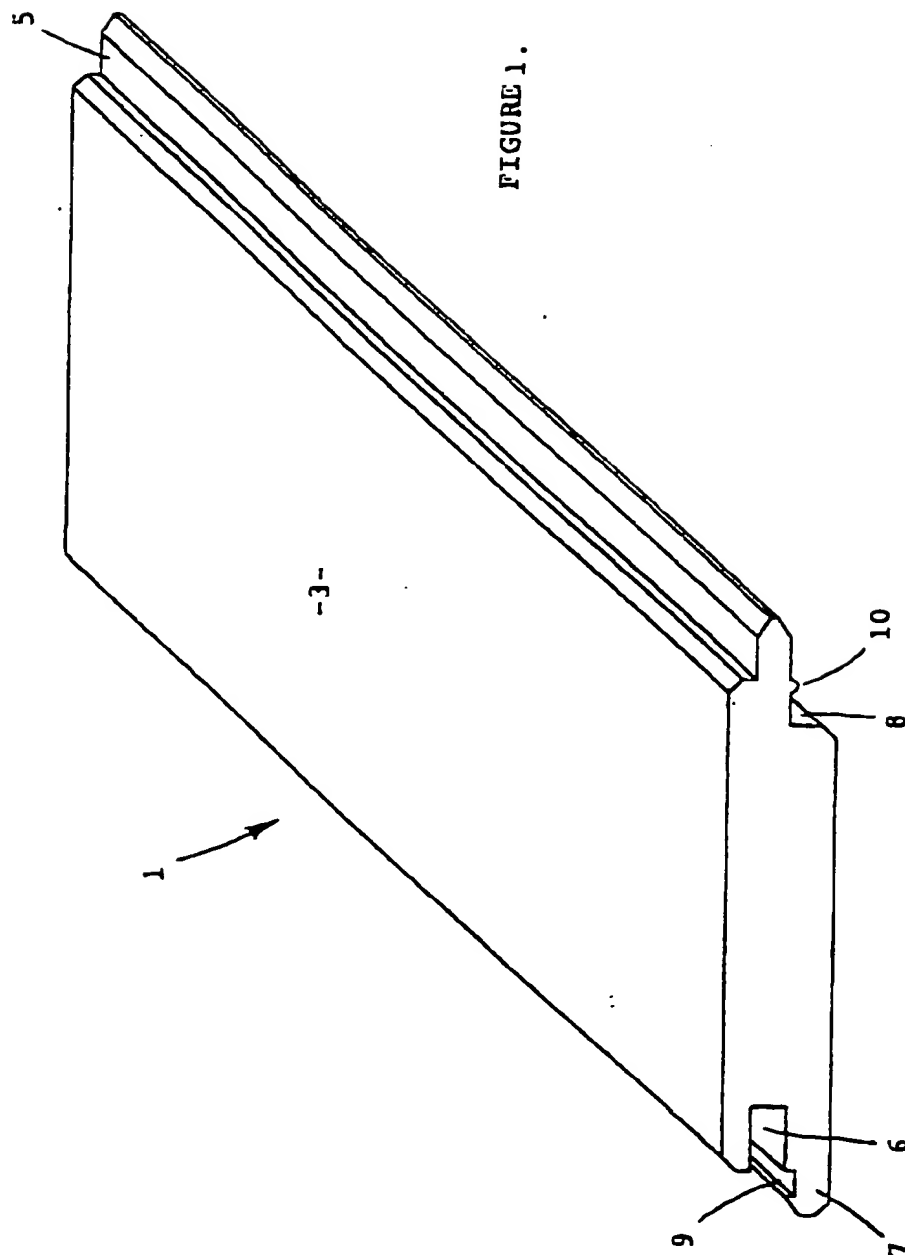
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23. A joint between adjoining side edges of two panels substantially as hereinbefore described with reference to Figures 1 to 5 of the accompanying drawings.

24. A panel substantially as hereinbefore described with reference to Figures 1 to 5 of the accompanying drawings.

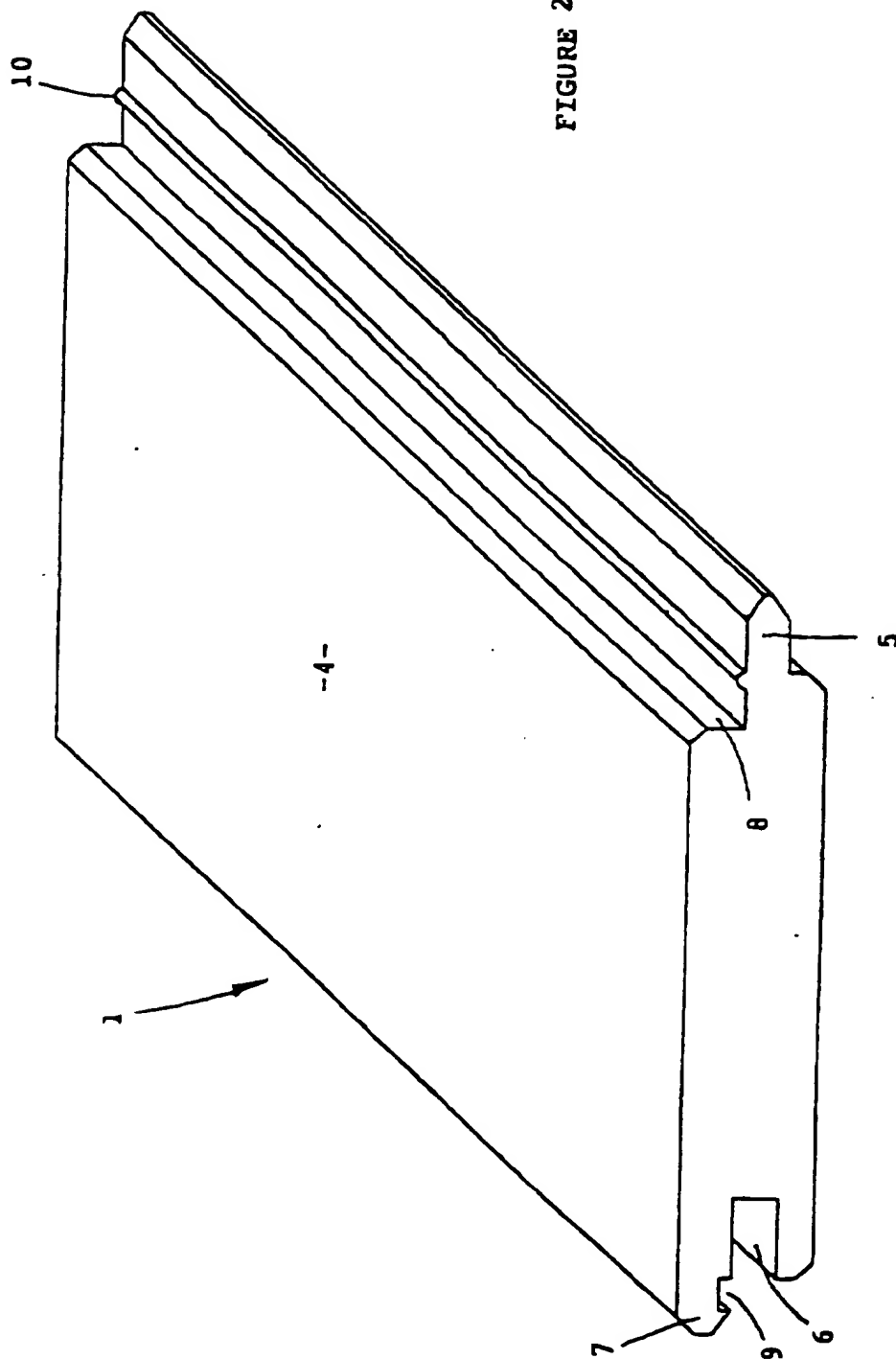
25. A door substantially as hereinbefore described with reference to Figures 6 to 9 of the accompanying drawing.

26. Any novel feature described herein and/or shown in the drawings.



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FIGURE 2.



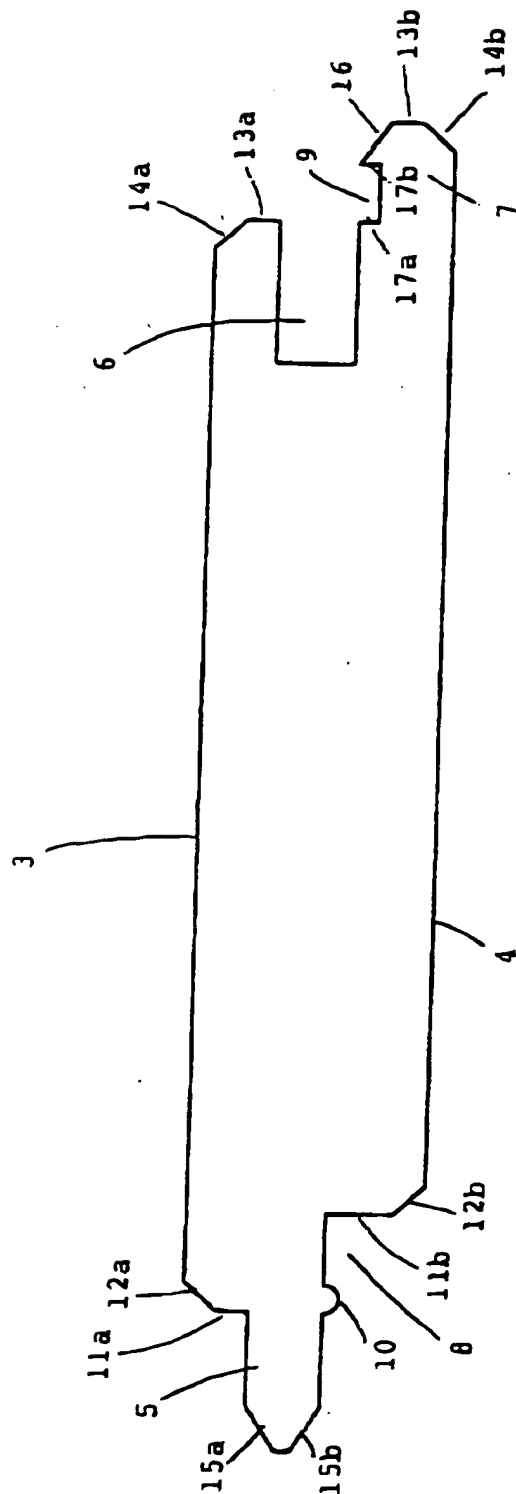


FIGURE 3

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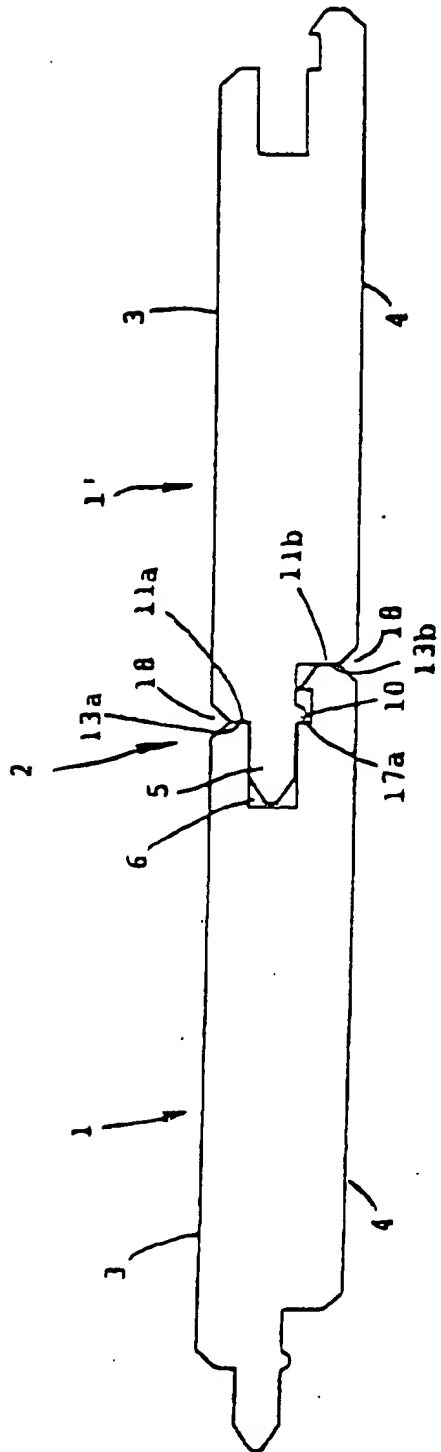


FIGURE 4.

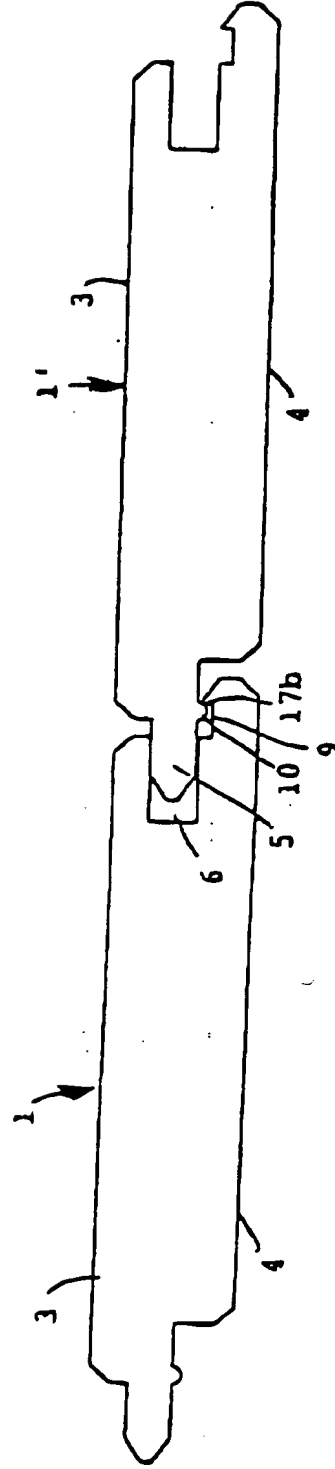


FIGURE 5.

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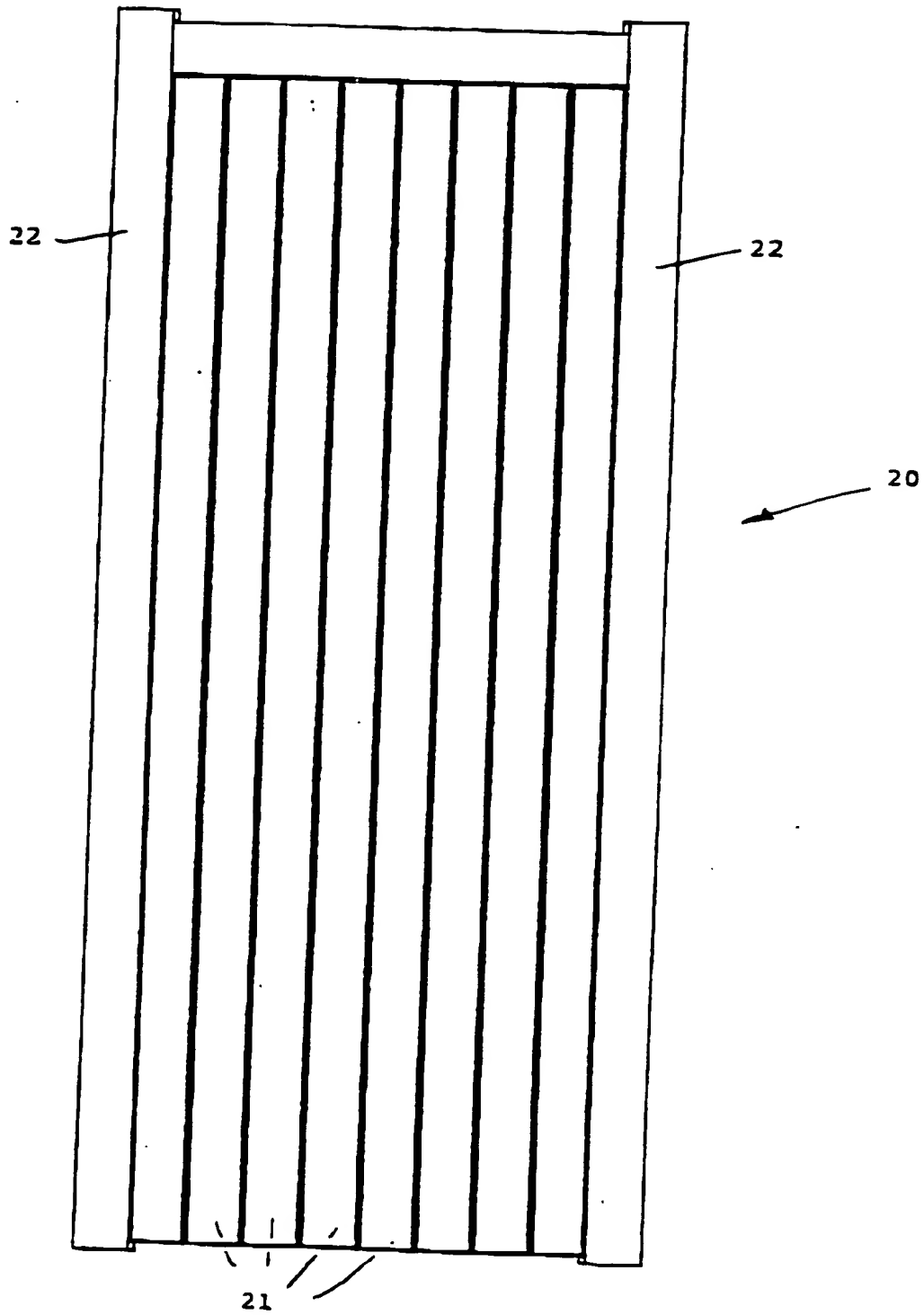


FIGURE 6

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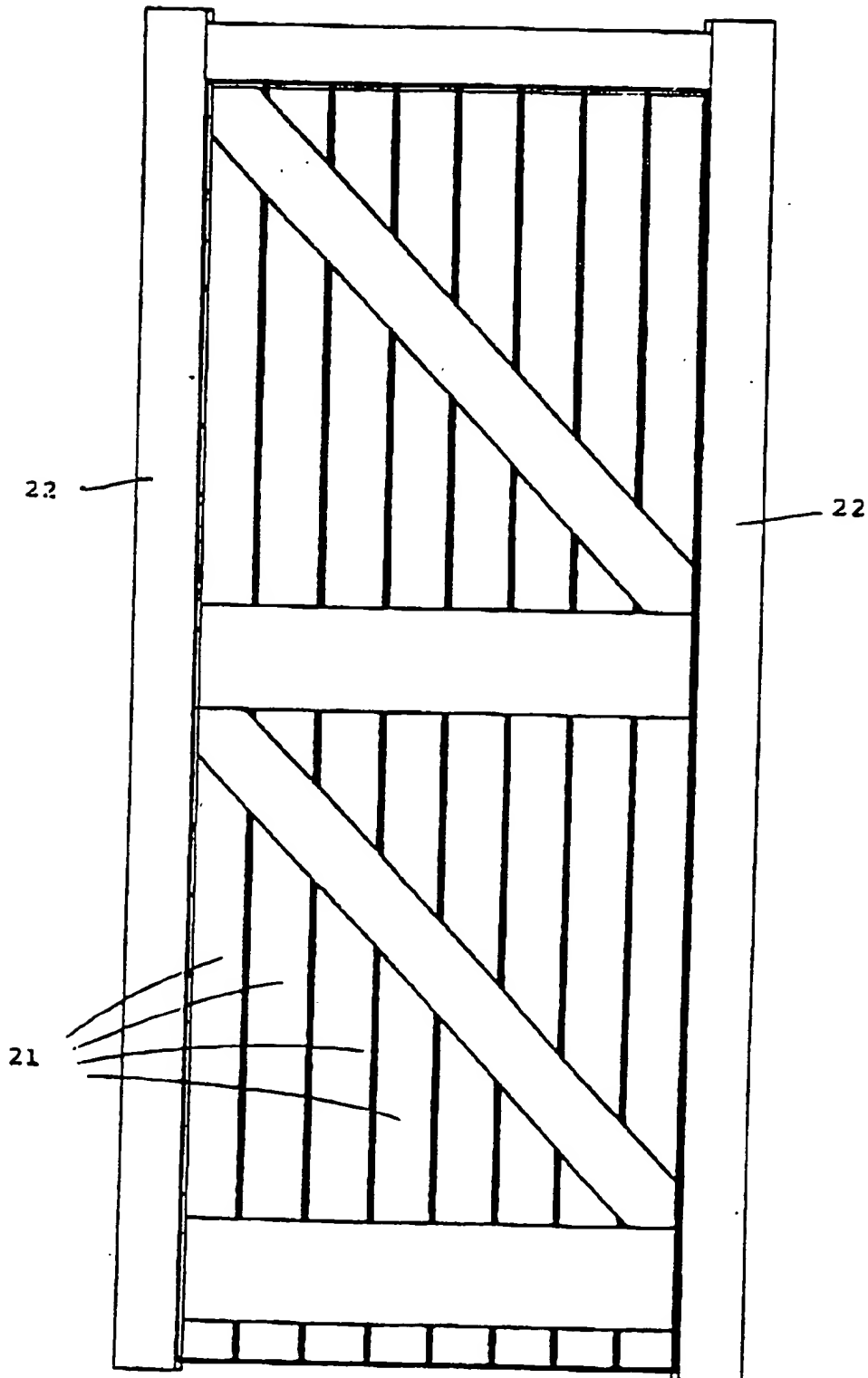


FIGURE 7.

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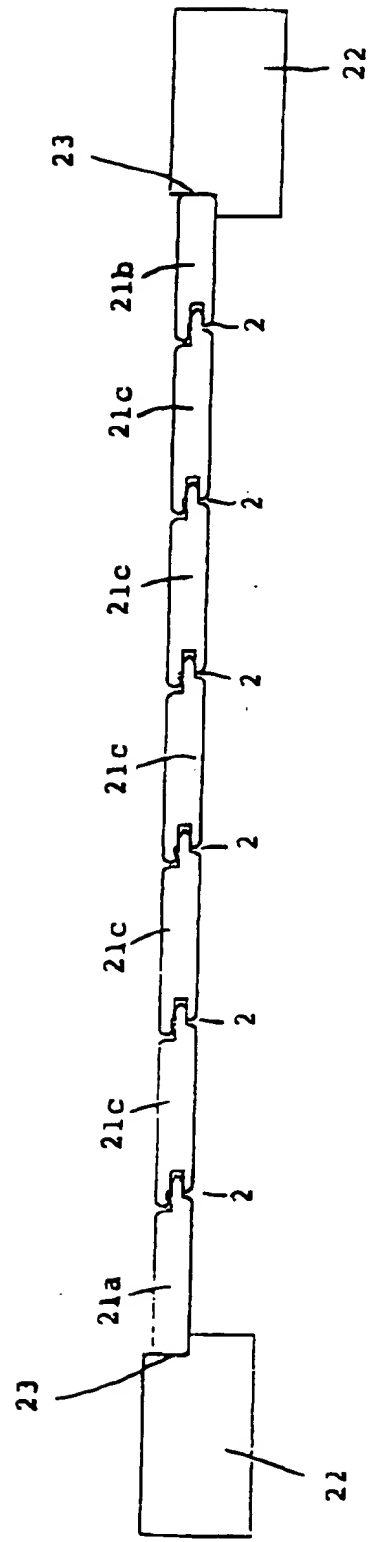


FIGURE 8.

Mr. D Whiteman,

GB 2 256 023 shows substantially an identical tongue and groove connection for individual structural panels, in this case panels used in a door. A play is provided between the panels so they can move in the manner depicted in Figures 4 and 5 of the Patent to reveal a groove on the front side of the panels.

In accordance with U.S. 5 706 621, rotation of one panel relative to the other is needed to assemble two panels together. However, in accordance with Figures 3a - 3c of the Patent, the panels can be connected by laterally sliding one panel relative to the other to interconnect the tongue and grooves (sometimes used to join the short ends of the panels together).

GB 2 256 023 seems to require some tipping or rotation of one panel relative to the other to enable the panels to be connected together. After such connection, the panels are restrained against separation by the tongue and groove connection.

We would like to develop information with regard to the following areas with Magnet.

1. Are samples of the panels described in the Magnet Patent still available? If so, we would be most interested in studying samples of the panels.
2. Did the short ends of the door panels include any type of tongue and groove connection.
3. Could the panels be separated after they were joined together by reverse rotation of the panels and separating one panel from the other.
4. Once the panels were joined together as shown in the Patent, was it possible to readily slide the panels relative to each other in the lengthwise direction?
5. Are there any detailed drawings available showing the detailed dimensions of the tongue and groove areas of the panels that are available for review?
6. We would be most interested in discussing the panels with someone having knowledge of the state of the art pertaining to such tongue and groove locking panels in 1991 when the Patent application was filed.

7. Did Magnet produce and market other kinds of panels that could be secured together using locking tongues and grooves?

This matter is somewhat urgent and I would be grateful if you could put me in touch with the relevant person at Magnet in order that we can give consideration to these points in the next few days.

Yours sincerely,
APPLEYARD LEES

Hugh Sherrard-Smith

Encs: Copy of U.K. Patent 2 256 023
Copy of U.S. Patent No. 5 706 621

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Incorporating Audrey Knowles & Co.

Mr. H. Sherrard-Smith
Appleyard Lees
15 Clare Road
Halifax
HX1 2HY

VIA FACSIMILE TRANSMISSION

Your ref.
HSS/AJP/M8030

Our ref
DAW304

15 March 1999

Dear Mr. Sherrard-Smith,
UK Patent No. 2256023
Magnet Holdings Limited

In reply to your letter of 25 February 1999 our client has provided the following information on the specific points raised:-

1. No. It is over 5 years since our client manufactured this product.
2. No. The short ends located directly into the rebate in the stile and rail.
3. Yes.
4. Yes.
5. Yes. Our client may be prepared to provide copies of these subject to suitable assurances/undertakings from your client as to their use and return of any drawings.
6. Our client will consider this request if you still believe discussion useful. It is likely they would want any discussion to be attended by myself.
7. No.

I hope this information is of assistance and look forward to hearing from you on any further matters your client wishes to raise.

[illegible]